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Note

THE VAPOUR PRESSURE OVER Al_2Se_3

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Apparently, no vapour pressure data for Al_2Se_3 have been reported in the literature. Gattow and Schneider [1] measured the vapour pressure above a mixture of Al_2Se_3 and Al and, considering that the vaporization occurs by the reaction

$$Al_2Se_{3(l)} + 4Al_{(l)} = 3Al_2Se_{(g)} \quad (1)$$

report the pressure–temperature equation

$$\log p(\text{kPa}) = 8.907 - 11984/T$$

We have measured the total vapour pressure above liquid Al_2Se_3 using an Ugine–Eyraud vacuum thermobalance, by the Knudsen-effusion method. The experimental assembly employed is described in a previous work [2]. According to the results reported for other selenides [3], the probable vaporization reactions were assumed to be

$$Al_2Se_{3(l)} = Al_2Se_{(g)} + Se_{2(g)} \quad (2)$$

$$Al_2Se_{3(l)} = 2AlSe_{(g)} + 0.5Se_{2(g)} \quad (3)$$

$$Al_2Se_{3(l)} = 2Al_{(g)} + 1.5Se_{2(g)} \quad (4)$$

in which the molecular weight of the effusing vapours are 145, 116 and 83 respectively.

Three vaporization runs, in the overall temperature range 1467–1567 K were carried out. Graphite Knudsen cells differing in diameter and thickness of the effusion orifices, which had been calibrated by vaporizing Au as standard [4], were employed. Temperatures were measured with a Pt/Pt–10%Rh thermocouple, protected from Se_2 vapour with a tantalum foil cap. By least squares treatment of the experimental data, three pressure–temperature equations were derived. By weighting slopes and intercepts of these equations proportionally to the experimental points, the following equation was selected

$$\log p_{\text{tot}}(\text{kPa}) = (10.19 \pm 0.18) - (19980 \pm 280)/T \quad (5)$$

where the associated errors are standard deviations. This selected log p_{tot}

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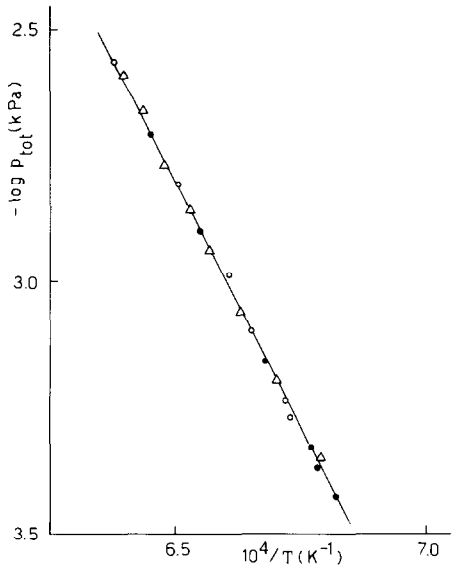

Fig. 1. Total vapour pressure over liquid Al_2Se_3: selected eqn. (5) together with three sets of experimental values.

versus $1/T$ equation is reported in Fig. 1 together with the experimental total vapour pressure values. As information on the true vaporization process was lacking, in the calculation it was assumed that Al_2Se_3 vaporizes according to reaction (3). It is to be pointed out that the uncertainty due to the assumption of reaction (3) instead of reactions (2) or (4) for the vaporization process, results in an error of ± 0.12 in the intercept of eqn. (5), an amount which is comparable to the associated standard deviation. Therefore, if the true vaporization process is described by whichever of the hypothesized reactions (2)–(4), the total vapour pressure over Al_2Se_3 may well be represented by eqn. (5).

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